

# **Methods for Managing Quality**

## **Case Study**

# CASE STUDY BACKGROUND

**ACTIVITY:** Fleet Industrial Supply Center (FISC), Camp Lake

**PURPOSE:** To provide supply support services to fleet and shore activities in the Lake region.

Note: The Case Study presents a fictional FISC. Processes may not be portrayed accurately and the outcome may vary from the perceptions of those who have knowledge of, or experience in, a real FISC.

**BACKGROUND:** It is helpful to think of one of the major responsibilities of the FISC as being similar to a commercial catalog merchandise warehouse. Customers place orders on items identified in catalogs. Orders are entered into a database. Material, which has been ordered from vendors and stocked in the warehouse, is pulled from shelves or bins, packaged, picked up at the loading dock or customer pickup station, or shipped via commercial carrier. The other major responsibility of the FISC is to provide technical contract support to its external customers by placing orders for materials that are valued at more than \$25,000 and that are not available directly through the FISC.

## CASE-1

# **CASE STUDY MISSION STATEMENT**

**We are the Fleet Industrial Supply Center of Camp Lake.**

**We provide:**

- Information Services
- Accounting Services
- Shipment of Orders
- Customer Orders Services

to our fleet and shore commands of the Lake region.

# CASE STUDY EXTERNAL CUSTOMER LIST

- Ships at Sea
- Naval Shore Commands
  - Shipyards
  - Naval Air Stations
  - Hospitals/Medical Centers
  - Coast Guard
  - Naval Base
  - Weapons Center
  - Naval Electronics Center
  - NAVSUP Headquarters
  - Naval Public Works Center
  - NAVFAC
- Inventory Control Point Manager

## CASE-3

# Customer Needs Form

**Customer:**

**Interviewed by:**

**Date:**

1. CUSTOMER NEEDS	2. IMPORTANCE	3. PERFORMANCE	4. CONCERNS
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	

IMPORTANCE

**RATING GUIDE FOR CUSTOMER NEEDS**

1	2	3	4	5
Lowest				Highest

PERFORMANCE

1	2	3	4	5
Poor performance, very dissatisfied	Inconsistent or somewhat inadequate performance	Adequate performance; meets minimum req's	Very good performance; customer is very satisfied	Best in class; sets new standards for performance

**CASE-4**

# Case Study Customer Needs Form

**Customer:**

**Interviewed by:**

**Date:**

1. CUSTOMER NEEDS	2. IMPORTANCE	3. PERFORMANCE	4. CONCERNS
Flexibility in filling partial orders	1 2 3 4 5	1 2 3 4 5	
Orders to be filled accurately	1 2 3 4 5	1 2 3 4 5	Correct material received without damage
Quick delivery of orders	1 2 3 4 5	1 2 3 4 5	
Improved billing service	1 2 3 4 5	1 2 3 4 5	Billing is received before the material is
Provide training to customers	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	
	1 2 3 4 5	1 2 3 4 5	

IMPORTANCE

RATING GUIDE FOR CUSTOMER NEEDS

1	2	3	4	5
Lowest				Highest

PERFORMANCE

1	2	3	4	5
Poor performance, very dissatisfied	Inconsistent or somewhat inadequate performance	Adequate performance; meets minimum req's	Very good performance; customer is very satisfied	Best in class; sets new standards for performance

**CASE-5**

# CASE STUDY CUSTOMER NEEDS LIST

## EXTERNAL CUSTOMER

## NEED (IN PRIORITY ORDER)

### SHIPS AT SEA

5. Quick delivery of orders
4. Orders to be filled accurately
3. Solutions, not excuses, in filling orders
2. Flexibility in filling partial orders
1. Accurate info on expected delivery time

### SHIPYARDS

5. Orders to be filled accurately
4. Provide training to customers
3. Quick delivery of orders
2. Improved billing service
1. Flexibility in filling partial orders

### NAVAL AIR STATIONS

5. Orders to be filled accurately
4. Ability to pick up urgent material
3. Quick delivery of orders
2. Technical assistance on hard-to-find items
1. Flexibility in filling partial orders

### HOSPITALS/MEDICAL CENTERS

5. Orders to be filled accurately
4. Correct material cert. documents included
3. Provide training to customers
2. Flexibility in filling partial orders
1. Improved billing service

### COAST GUARD

5. Orders to be filled accurately
4. Material to be in inventory
3. Accurate info on expected delivery time
2. Ability to pick up urgent material
1. Technical assistance on hard-to-find items

### NAVAL BASE

5. Material to be in inventory
4. Orders to be filled accurately
3. Correct material cert. documents included
2. Accurate info on expected delivery time
1. Solutions, not excuses, in filling orders

### WEAPONS CENTER

5. Correct material cert. documents included
4. Provide training to customers
3. Good shelf life
2. Accurate info on expected delivery time
1. Improved availability of employees

## CASE-6 (1)

## EXTERNAL CUSTOMER

## NEED (IN PRIORITY ORDER)

### NAVAL ELECTRONICS CENTER

5. Good shelf life
4. Immediate replacement for damaged or wrong material
3. Orders to be filled accurately
2. Ability to pick up urgent material
1. Material to be undamaged

### NAVSUP HEADQUARTERS

5. Provide training to customers
4. Material to be in inventory
3. Immediate notification for out-of-stock items
2. Flexibility in filling partial orders
1. To be kept advised, no surprises

### NAVAL PUBLIC WORKS CENTER

5. Material to be undamaged
4. Quick delivery of orders
3. Flexibility in filling partial orders
2. Technical assistance on hard-to-find items
1. Packaging to be easily removed

### INVENTORY CONTROL POINT MANAGER

5. Immediate replacement for damaged or wrong material
4. Material to be in inventory
3. Improved billing service
2. Packaging to be easily removed
1. Good shelf life

### NAVFAC

5. Material to be undamaged
4. Immediate replacement for damaged or wrong material
3. Solutions, not excuses, in filling orders
2. To be kept advised, no surprises
1. Improved availability of employees

## CASE-6 (2)



# CASE STUDY AFFINITY CARDS

<b>Material to be in inventory</b>	<b>Ability to pick up urgent material</b>
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**4-5-4-4**

**4-2-2**

**Technical assistance/  
advice on hard to find  
items**

**Solutions, not excuses, in  
filling orders**

**2-1-2**

**1-3-3**

**Good shelf life**

**Flexibility in filling partial  
orders**

**3-1-5**

**3-2-1-1-2-2**

**Quick delivery of orders**

**Immediate notification for  
out-of-stock items**

**3-3-5-4**

**3**

**CASE-7 (1)**

**Improved availability of employees**

**To be kept advised - no surprises**

**1-1**

**1-2**

**Correct material certification documents included**

**Provide training to customers**

**4-3-5**

**4-5-4-3**

**Orders filled accurately**

**Accurate information on expected delivery times**

**5-4-3-5-4-5-5**

**2-1-3-2**

**Packaging to be easily removed**

**Immediate replacement for damaged or wrong material**

**2-1**

**4-5-4**

**Improved billing service**

**Material to be undamaged**

**2-3-1**

**5-5-1**

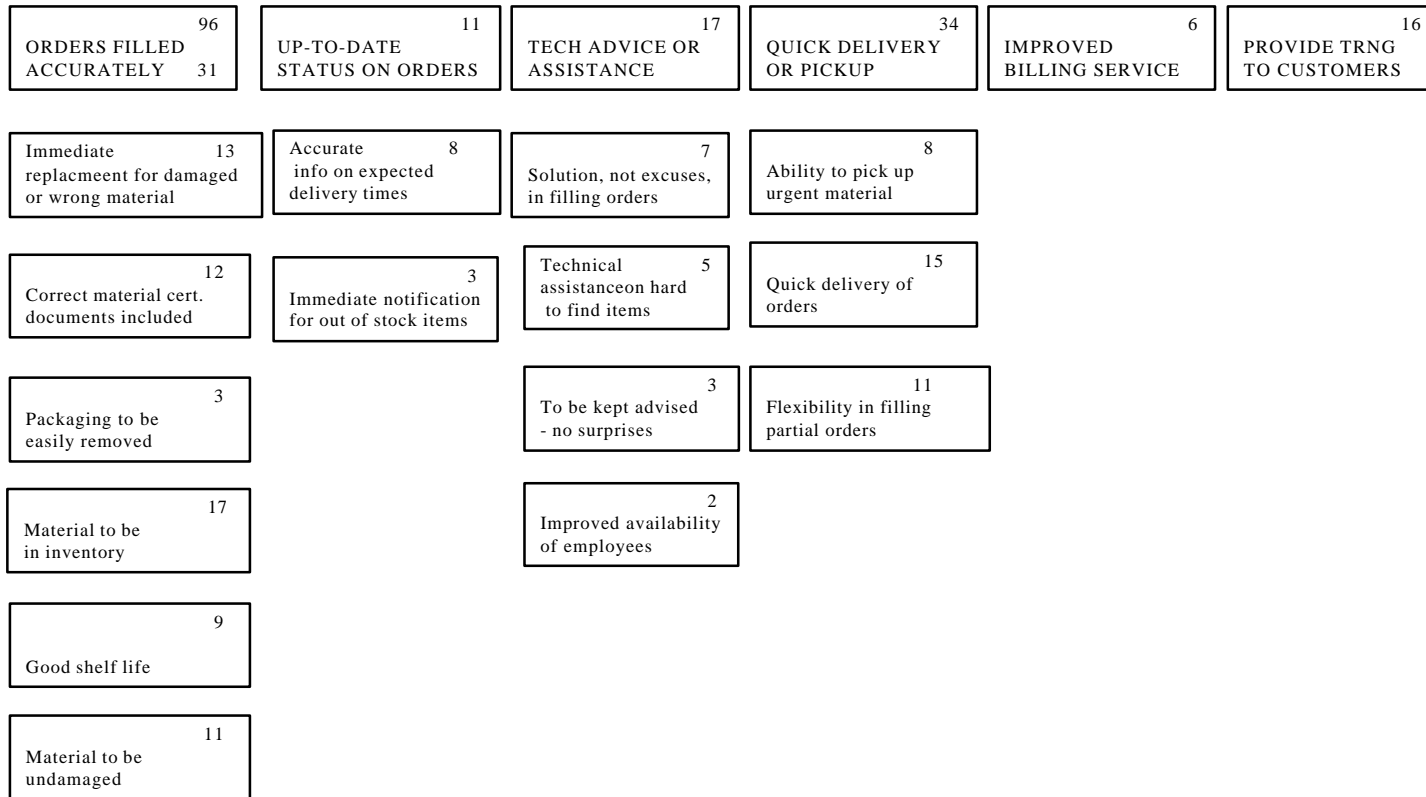
**CASE-7 (2)**

**Quick delivery or pickup**  
**5-3-3-4**

**Tech advice or**  
**assistance**  
**2-1-2**

**Up-to-date status on**  
**orders**  
**2-2-3**

# COMPLETED CASE STUDY AFFINITY DIAGRAM



## CASE-8

# CASE STUDY TREE DIAGRAM CARDS

**We are the Fleet Industrial Supply Center of Camp Lake. We Provide:**

- **Information Services**
- **Accounting Services**
- **Shipment of Orders**
- **Customer Orders Services**

**to our fleet and shore commands of the Lake region.**

**Prepare Shipping Documents**

**Issue Billing Documents**

**Provide Statements**

**Provide Assistance for Billing Inquirers**

**Provide Accounting Services**

**Pick Material**

**Fill Customer Orders**

**Provide Information Services**

**Contract for Shipping Carriers**

**Load Orders for Shipment**

**Issue Reports to HQ**

**CASE-9 (1)**

**Issue Credits to  
Customer Accounts**

**Provide Status on  
Customer Orders**

**Issue Credit Vouchers**

**Provide Technical Support  
for Ordering**

**Replace  
Discrepant/Damaged  
Material**

**Audit Inventory**

**Track Material**

**Train Employees**

**Transport Material**

**Material Layout**

**Ship Customer  
Orders**

**Receive and Stock  
Material**

**CASE-9 (2)**

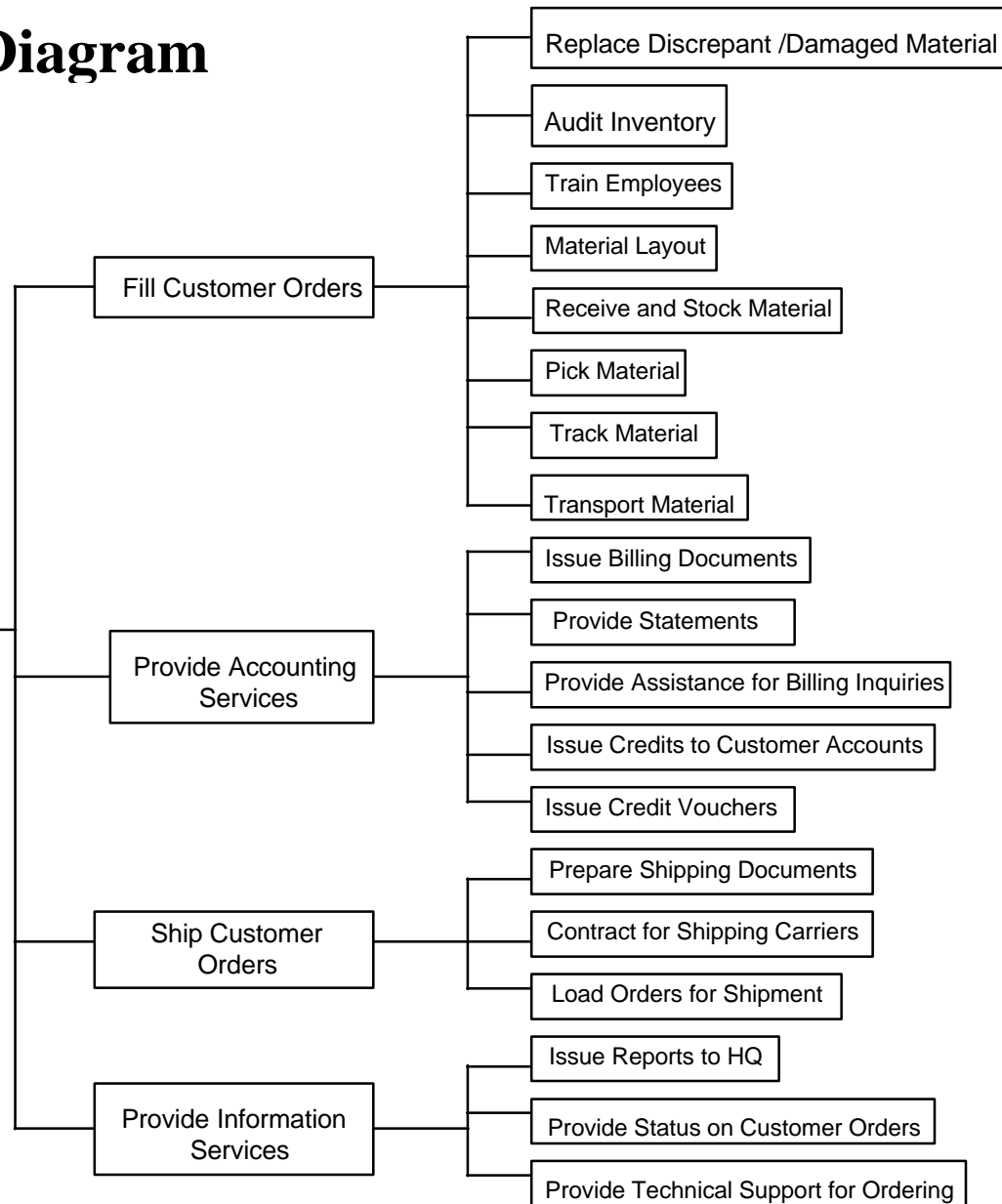
# Case Study Tree Diagram

We are the Fleet Industrial Supply Center of Camp Lake. We provide:

- Information Services
- Accounting Data
- Shipment of Orders
- Customer Orders Services

to our fleet and shore commands in the Lake region.

## CASE-10



## Legend

⊙	Strong relationship = 9
○	Some relationship = 3
△	Possible or weak = 1
—	No relationship = 0

## Case Study Matrix Diagram

**SIGNIFICANT PROCESSES**  
(from first level of Tree Diagram)

<b>CUSTOMER NEEDS</b> (From Affinity Header Cards)	Priority Rating	Fill Customer Orders	Provide Accounting Orders	Ship Customer Orders	Provide Information Services
Orders filled accurately					
Up-to-date status on orders					
Tech advice or assistance					
Quick delivery or pickup					
Improved billing service					
Provide training to customers					
<b>TOTAL</b>					

**CASE-11**



## Legend

⊙	Strong relationship	= 9
○	Some relationship	= 3
△	Possible or weak	= 1
—	No relationship	= 0

## Case Study Matrix Diagram

**Significant Processes**  
(From first level of Tree Diagram)

<b>Customer Needs</b> (From Affinity Header Cards)	Priority Rating	Fill Customer Orders	Provide Accounting Orders	Ship Customer Orders	Provide Information Services
Orders filled accurately	96	⊙ 864	△ 96	—	△ 96
Up-to-date status on orders	11	⊙ 99	—	○ 33	⊙ 99
Tech advice or assistance	17	—	○ 51	—	⊙ 153
Quick delivery or pickup	34	⊙ 306	—	⊙ 306	—
Improved billing service	6	△ 6	⊙ 54	○ 18	—
Provide training to customers	16	—	—	—	⊙ 144
<b>TOTAL</b>		1265	201	357	492

### CASE-12

# Key Quality Characteristics Worksheet

<b>Customer Needs</b> Customers perceive quality when they receive...	<b>Operational Definition</b> How do customers define the quality characteristic?	<b>Output Measurement</b> What can I measure to tell me if I am meeting customers' needs?

**CASE-13**

# Case Study Key Quality Characteristics Worksheet

<b>Customer Needs</b> Customers perceive quality when they receive...	<b>Operational Definition</b> How do customers define the quality characteristic?	<b>Output Measurement</b> What can I measure to tell me if I am meeting my customers' needs?
Material with adequate shelf life	When received by customer, material must have 80% of the suggested shelf life from date of manufacture remaining.	<ul style="list-style-type: none"> <li>◆ Shelf life remaining when received by FISC</li> <li>◆ Shelf life remaining when order shipped</li> </ul>
Undamaged material	Material is functional in accordance with designed operation and has no aesthetic blemishes such as scratches, chips, cracks, dents, or breaks.	<ul style="list-style-type: none"> <li>◆ Damage when received by FISC</li> <li>◆ Damage when order shipped to customer</li> </ul>
Certification documents included with material	When required, certification documents are included, match the product serial number, and are complete, undamaged, and legible 100% of the time.	<ul style="list-style-type: none"> <li>◆ Condition of certification documents when material received at FISC</li> <li>◆ Condition of certification documents when order shipped to customer</li> </ul>
Orders received quickly	Orders are received by customer within 5 working days of receipt of a telephone or fax order (Priority). Orders are received by customer within 15 working days from postmark for mailed order or Date Time Group (DTG) for message order (Routine).	<ul style="list-style-type: none"> <li>◆ Cycle time between FISC receipt of telephone or fax order and material receipt by customer for priority orders</li> <li>◆ Cycle time between postmark or Date Time Group and material receipt by customer for routine orders.</li> </ul>

## CASE-14

# CASE STUDY CRITICAL PROCESSES LIST

Significant Process Fill Customer Orders

Audit inventory

Train employees

Material layout

Receive and stock material

Replace discrepant/damaged material

Track material

Transport material

Pick materials

CASE-15

# CASE STUDY COMBINATION ID MATRIX

	REPLACE DISCREP/DAM MAT'L	PICK MAT'L	TRANSPORT MAT'L	TRACK MAT'L	AUDIT INVENTORY	TRAIN EMPLOYEES	MAT'L LAYOUT	RECEIVE/ STOCK MAT'L	I N	O U T	T O T	S T G
REPLACE DISCREP/DAM MAT'L												
PICK MAT'L												
TRANSPORT MAT'L												
TRACK MAT'L												
AUDIT INVENTORY												
TRAIN EMPLOYEES												
MAT'L LAYOUT												
RECEIVE/ STOCK MAT'L												

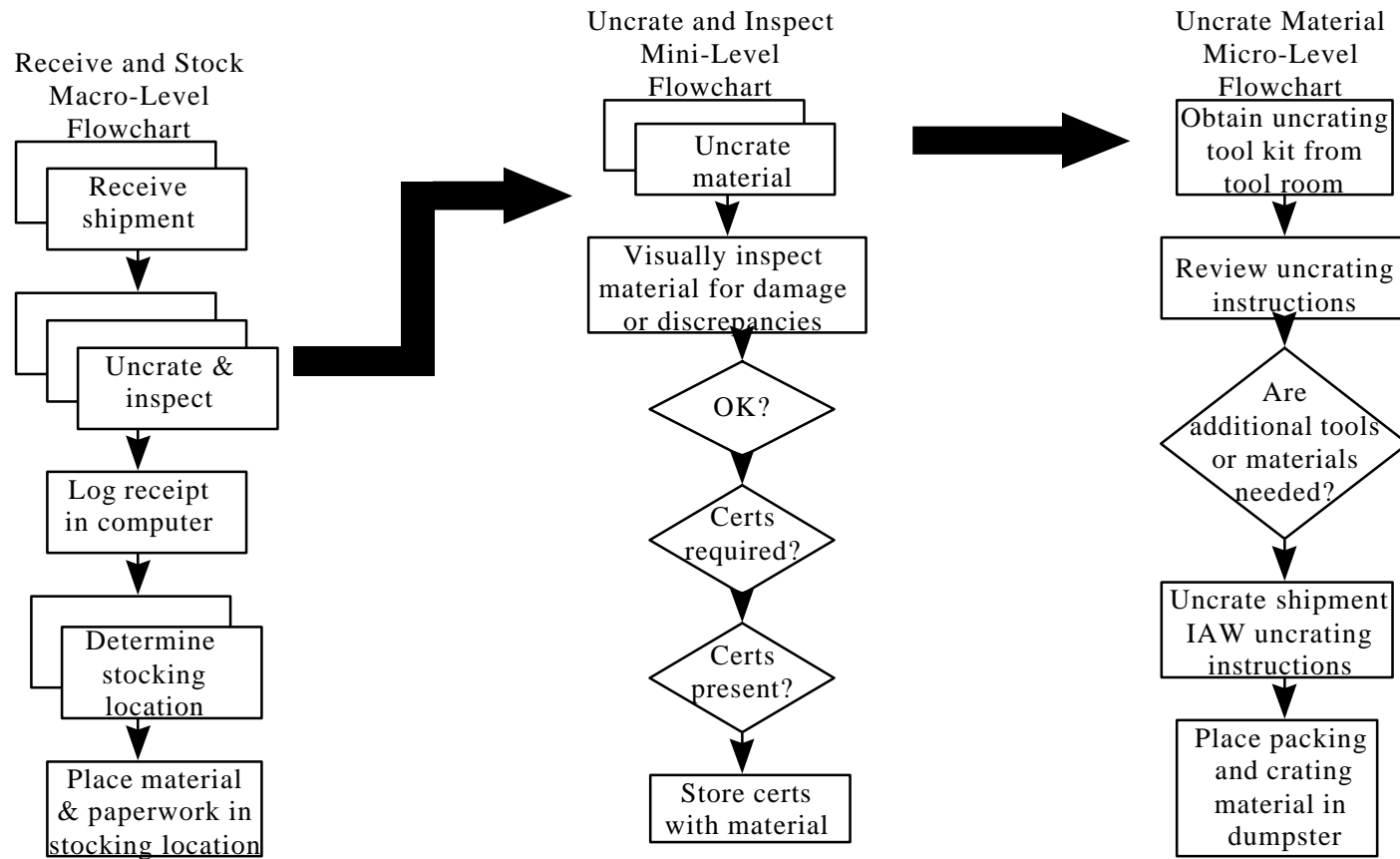
**CASE-16**

# CASE STUDY COMBINATION ID MATRIX

	REPLACE DISCREP/DAM MAT'L	PICK MAT'L	TRANSPORT MAT'L	TRACK MAT'L	AUDIT INVENTORY	TRAIN EMPLOYEES	MAT'L LAYOUT	RECEIVE/ STOCK MAT'L	I N	O U T	T O T	S T G
REPLACE DISCREP/DAM MAT'L		○ ↑	△ ↑	○ ↑	○ ↑	○ ↑	—	⊙ ↑	0	6	6	22
PICK MAT'L	○ ←		⊙ ↑	○ ↑	△ ↑	⊙ ↑	⊙ ←	⊙ ←	3	4	7	43
TRANSPORT MAT'L	△ ←	⊙ ←		○ ↑	—	○ ↑	○ ←	—	3	2	5	19
TRACK MAT'L	○ ←	○ ←	○ ←		○ ↑	○ ↑	—	⊙ ←	4	2	6	24
AUDIT INVENTORY	○ ←	△ ←	—	○ ←		○ ↑	○ ←	⊙ ←	5	1	6	22
TRAIN EMPLOYEES	○ ←	⊙ ←	○ ←	○ ←	○ ←		○ ←	⊙ ←	7	0	7	33
MAT'L LAYOUT	—	⊙ ↑	○ ↑	—	○ ↑	○ ↑		○ ↑	0	5	5	21
RECEIVE/ STOCK MAT'L	⊙ ←	⊙ ↑	—	⊙ ↑	⊙ ↑	⊙ ↑	○ ←		2	4	6	48

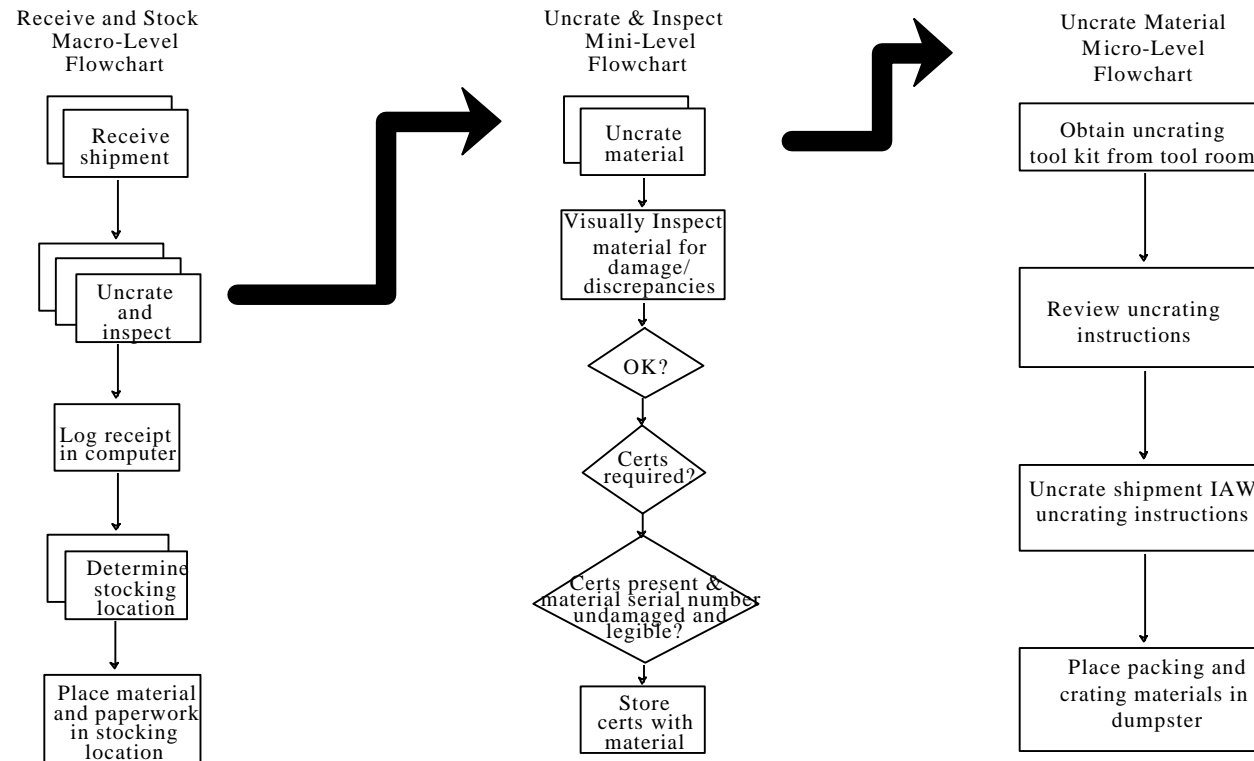
CASE-17

# Case Study Receive and Stock Material Process



CASE-18

# Refined Case Study Receive and Stock Material Process



**CASE-19**



# Macro-Level Flowchart

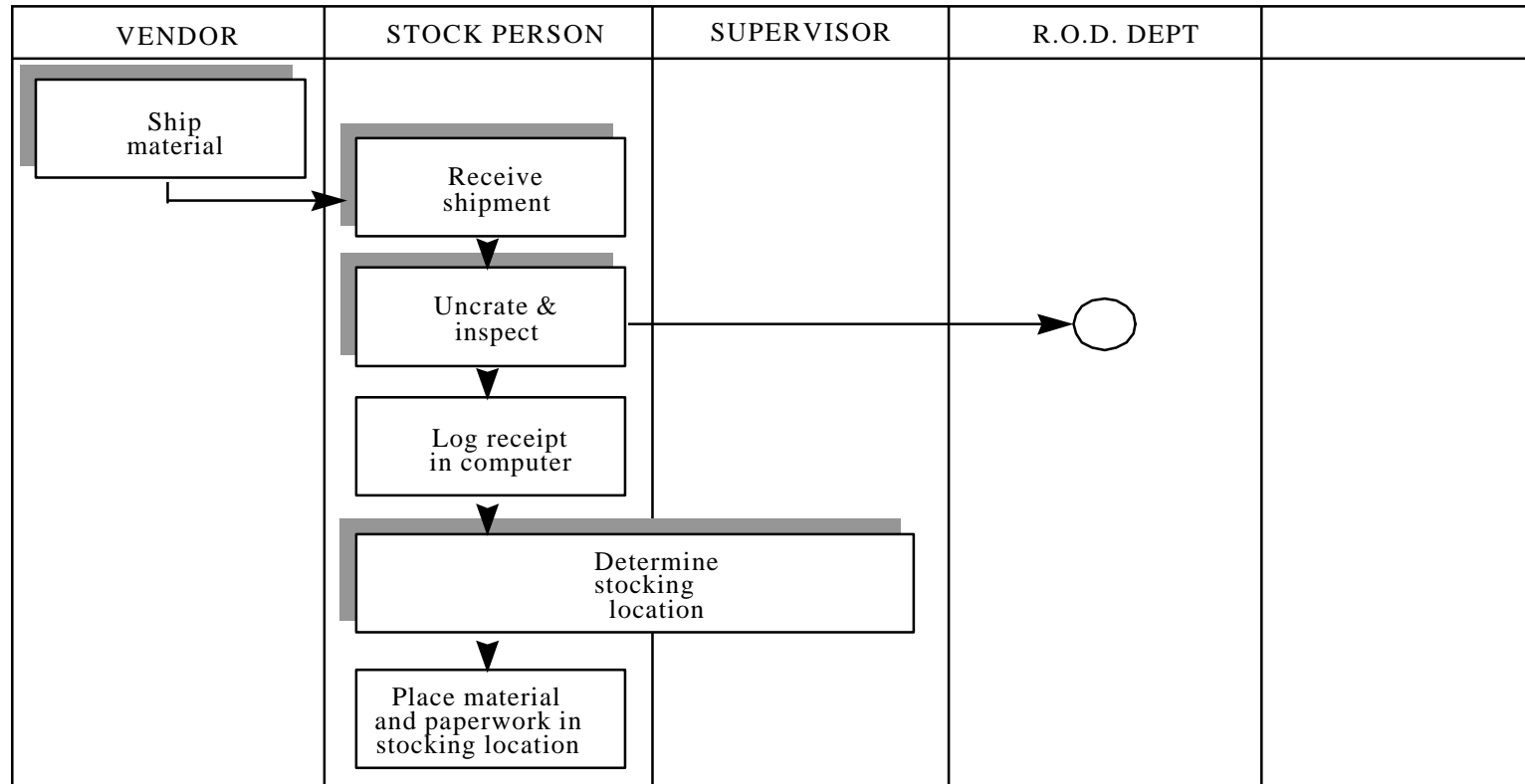
REFINED

PROCESS: Receive and Stock Material

PREPARED BY: \_\_\_\_\_

ACTIVITY: \_\_\_\_\_

DATE: \_\_\_\_\_



**CASE-20 (1)**

# Mini-Level Flowchart

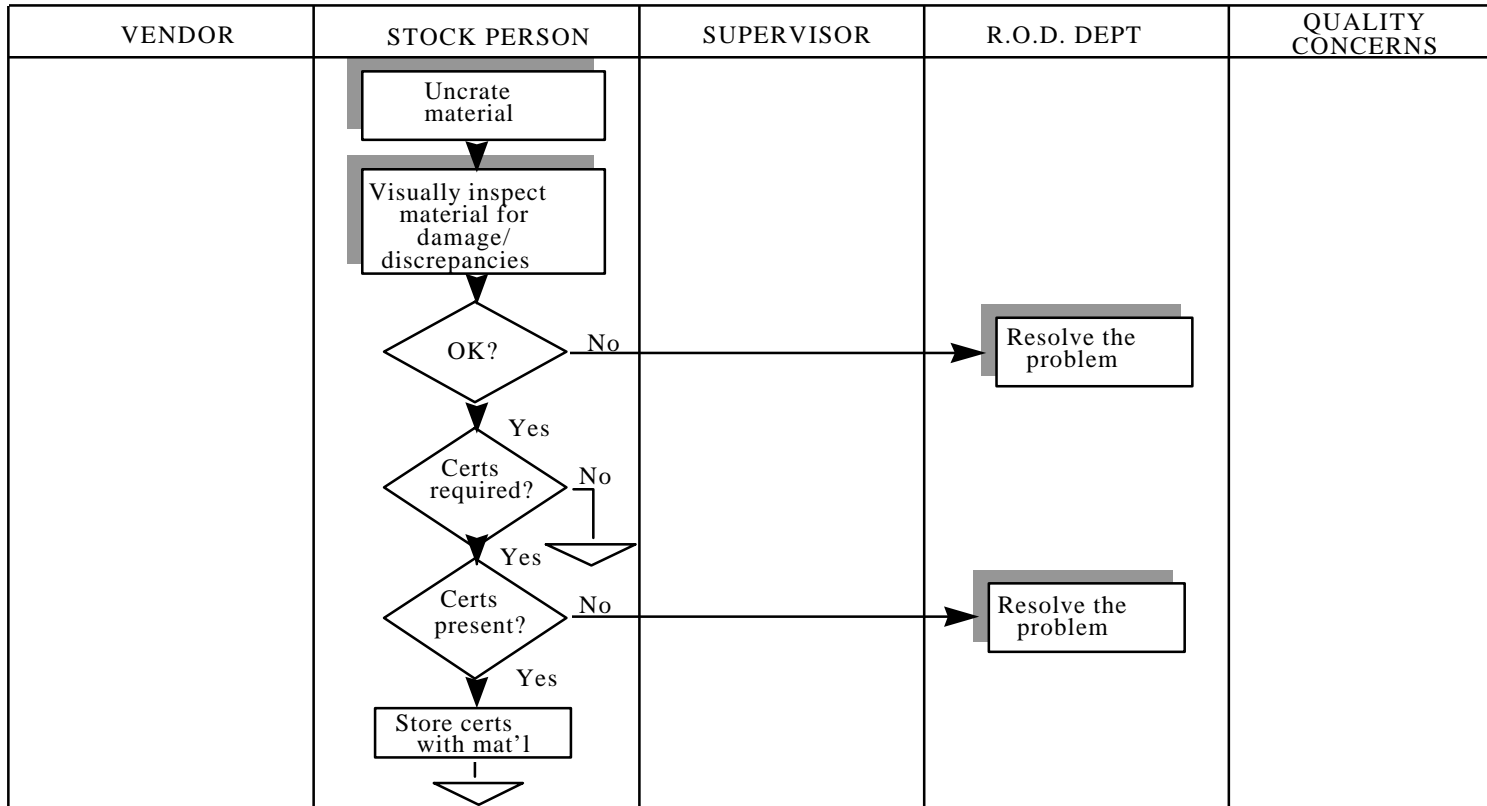
REFINED PROCESS

PROCESS: Receive and Stock Material

PREPARED BY: \_\_\_\_\_

ACTIVITY: Uncrate and Inspect

DATE: \_\_\_\_\_



**CASE-20 (2)**

# Micro-Level Flowchart

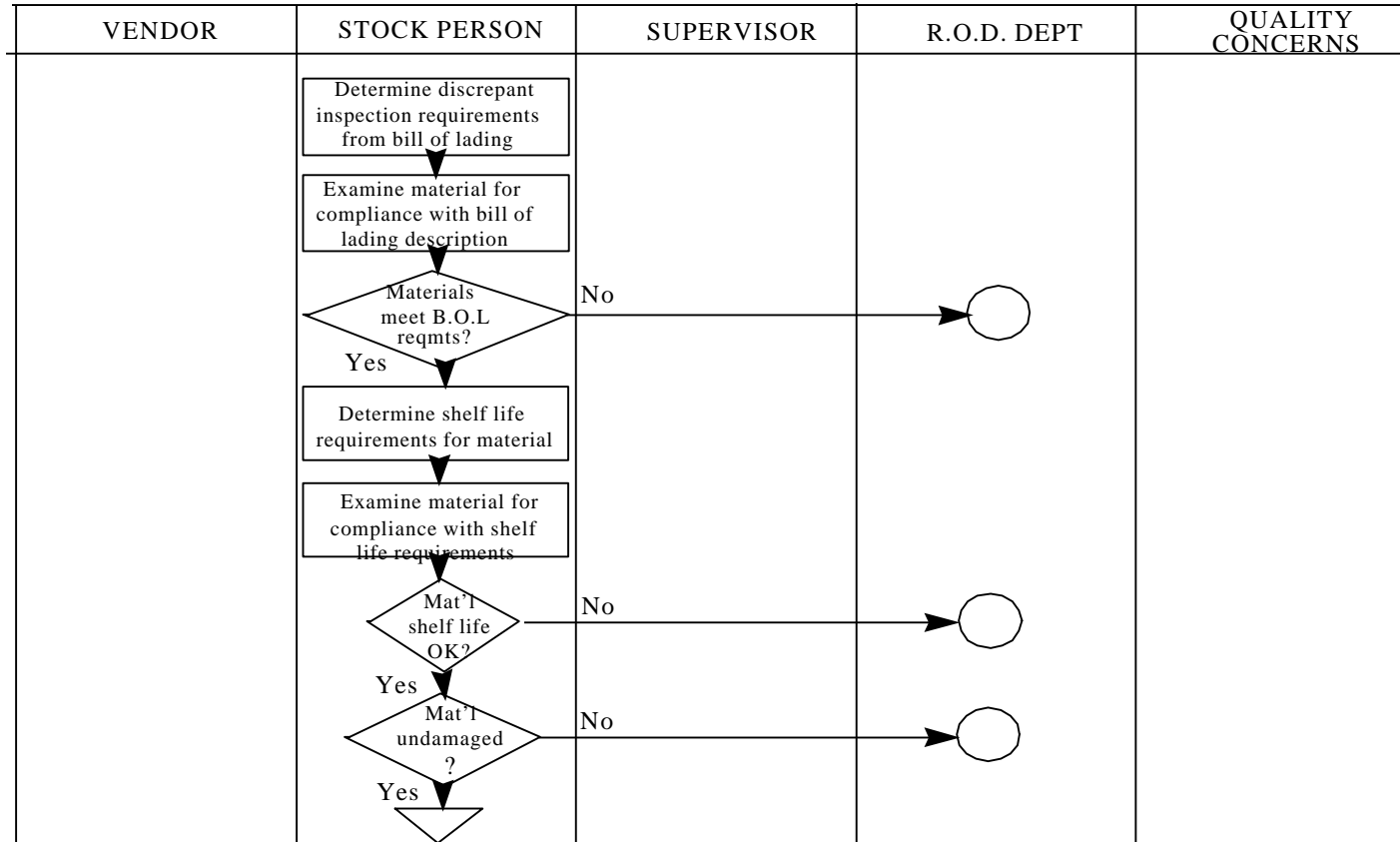
REFINED PROCESS

PROCESS: Receive and Stock Material

PREPARED BY: \_\_\_\_\_

ACTIVITY: Visually inspect material for damage/discrepancies

DATE: \_\_\_\_\_

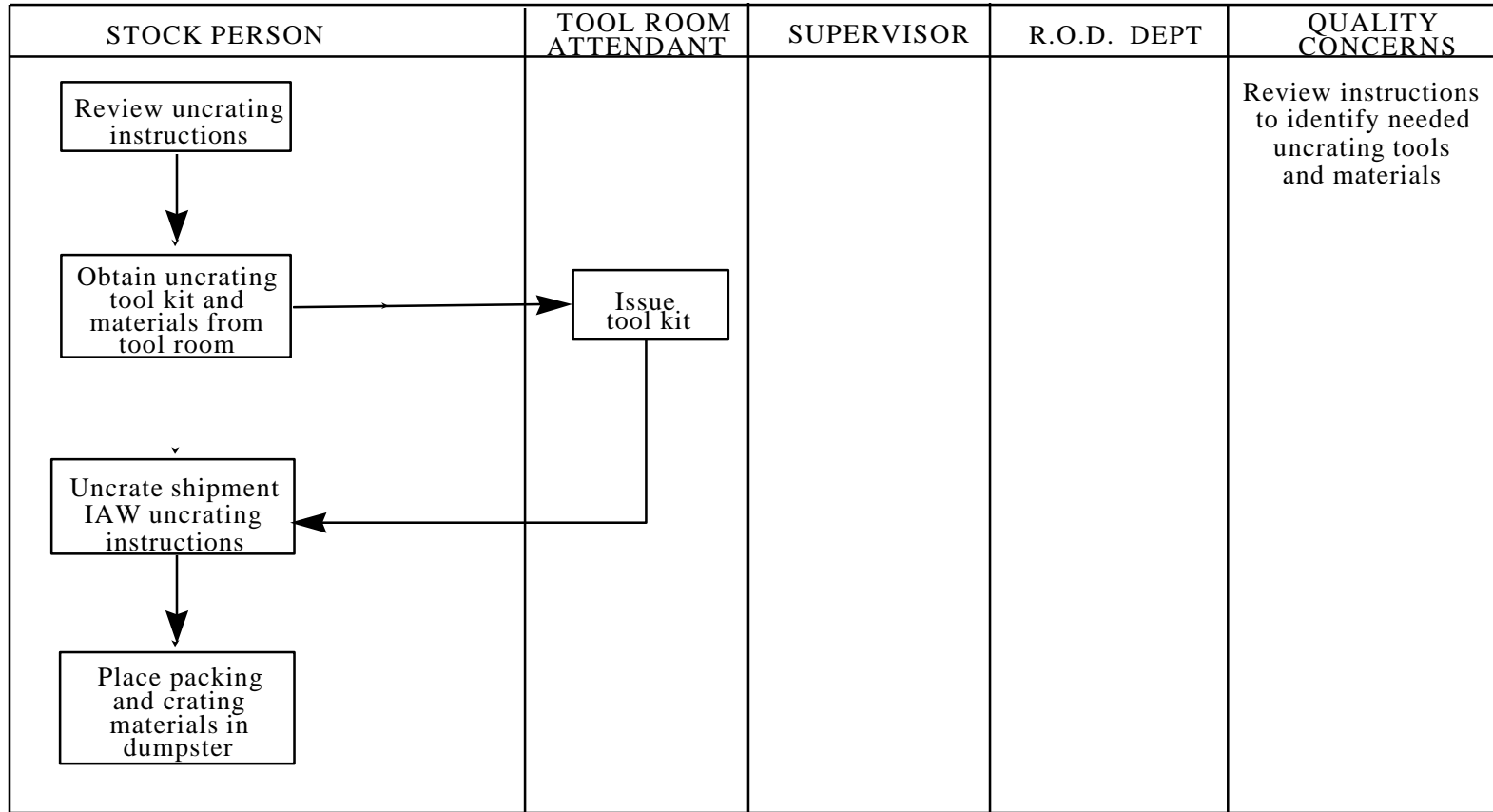


**CASE-20 (3)**

# Micro-Level Flowchart

PROCESS: Receive and Stock Material PREPARED BY: \_\_\_\_\_  
 ACTIVITY: Uncrate Material DATE: \_\_\_\_\_

REFINED PROCESS



**CASE-20 (4)**

# Process Measurement Chart

Process Step	What data are being collected?	Who is collecting data?	Data collection method	Frequency of data collection	Data collection form	How will data be analyzed?	Frequency of review	Who reviews?	Comments

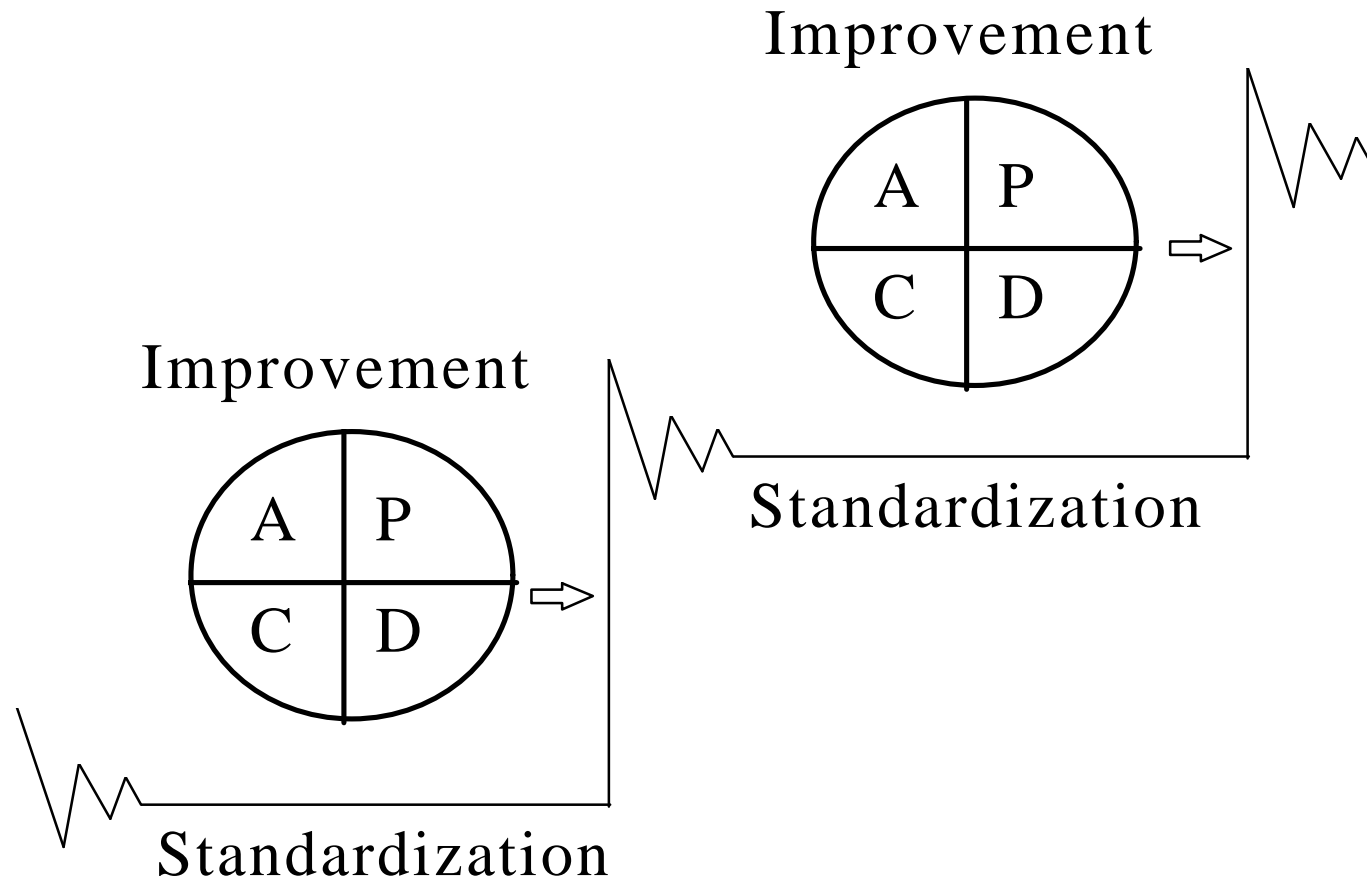
**CASE-21**

# Case Study Process Measurement Chart

Process Step	What data are being collected?	Who is collecting data?	Data collection method	Frequency of data collection	Data collection form	How will data be analyzed?	Frequency of review	Who reviews?	Comments
Visually inspect mat'l for damage/ discrepancies	# of shelf life items with < 80% shelf life remaining	Persons receiving material	100% inspection	Daily	Check sheet	<u>Run chart</u>	Monthly	Supervisor	
Visually inspect mat'l for damage/ discrepancies	# of items with damage	Persons receiving material	100% inspection	Daily	Check sheet	Run chart	Monthly	Supervisor	

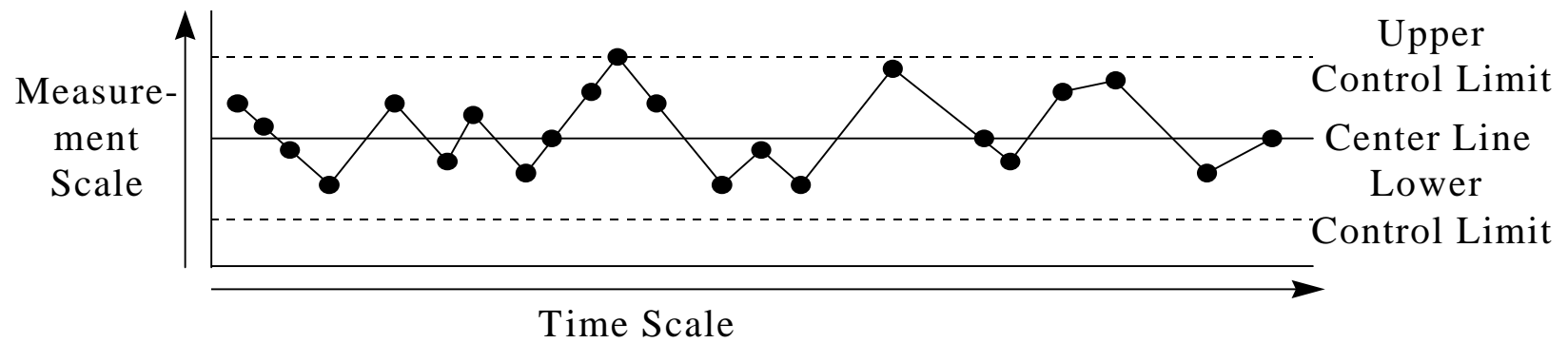
## CASE-22

# Process Standardization



**CASE-23**

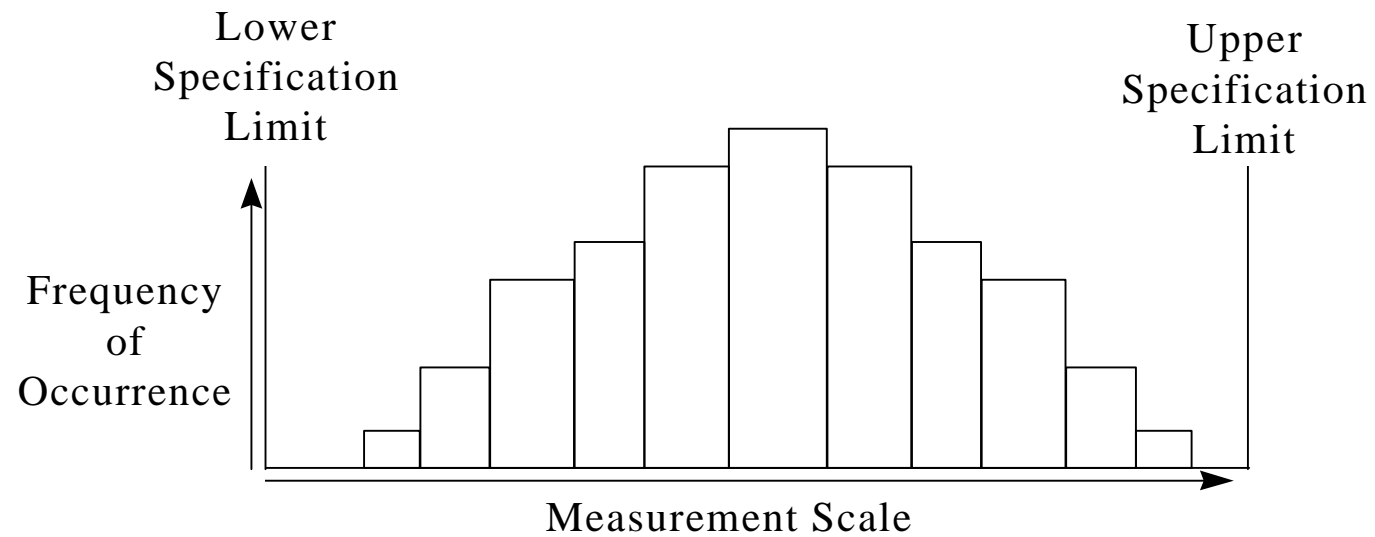
# Control Chart



**CASE-24**

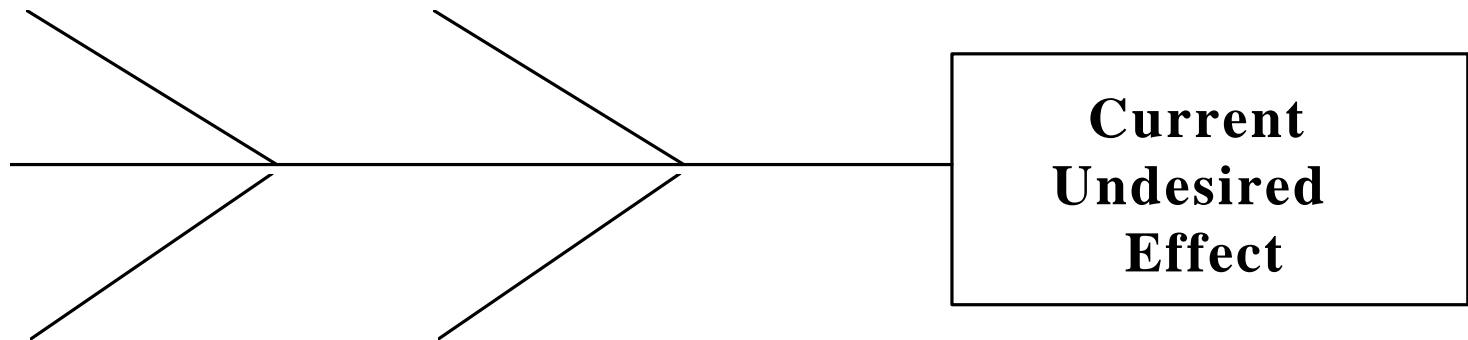


# Histogram



**CASE-25**

# Root Cause Analysis



**CASE-26**

# CASE STUDY WRAP-UP

The Fleet Industrial Supply Center (FISC) ESC completed steps 1 through 5 of the Process Management Flowchart to determine which of their significant processes to focus on first.

STEP 1: Assessing their Mission - FISC's Mission Statement served as the ESC's Purpose Statement:

We are the Fleet Industrial Supply Center of Camp Lake.

We provide:

- Information Services
- Accounting Services
- Shipment of Orders
- Customer Orders Services

to our fleet and shore commands of the Lake region.

STEP2: IDENTIFYING THEIR CUSTOMERS - The ESC developed and examined the extended systems view of the FISC, identifying the end-users of their products/services (external customers) as FISC's highest priority stakeholders:

Ships, Shipyards, Naval Air Stations, Hospitals/Medical Centers, Coast Guard, Naval Base, Weapons Center, Naval Electronics Center, NAVSUP Headquarters, Naval Public Works Center, Naval Facilities Engineering Command, Inventory Control Point Manager.

STEP 3: IDENTIFYING THEIR CUSTOMERS' NEEDS - The ESC collected customer needs data using the **Customer Needs Form** and then used an **Affinity Diagram** (one of the 7MP tools) to organize the large volume of data into logical customer needs groups:

Orders filled accurately  
Up-to-date status on orders  
Technical advice/assistance  
Quick delivery or pickup  
Improved billing service  
Provide training to customers

STEP 4: (a) IDENTIFYING THEIR SIGNIFICANT PROCESSES - The ESC used a **Tree Diagram** (one of the 7MP tools) to identify the Significant Processes (first level) and the Critical Processes (second level):

## CASE-27(1)

Fill Customer Orders  
Provide Accounting Service  
Ship Customer Orders  
Provide Information Services

(b) PRIORITIZING THEIR SIGNIFICANT PROCESSES - The ESC aligned customers' needs (from the Affinity Diagram header cards) with significant processes (from the first level of the Tree Diagram) using a **Matrix Diagram** (one of the 7MP tools), and identified the significant process to focus on first:

### **Fill Customer Orders**

STEP 5: ESTABLISH OUTPUT MEASURES - They worked with their customers to develop Operational Definitions for the customer needs directly related to this significant process, and used a **Key Quality Characteristics Worksheet** to translate customer quality characteristics into Output Measures.

The ESC chartered a QMB to improve the accuracy for the Fill Customer Orders process without sacrificing cycle time. As part of the charter, the QMB was directed to monitor and analyze the Output Measures as they endeavor to improve the process.

STEP 6: IDENTIFYING THE CRITICAL PROCESS - The QMB identified all of the critical processes of the Fill Customer Orders Significant process:

Audit Inventory  
Train Employees  
Material Layout  
Receive and Stock Material  
Replace Discrepant/Damaged Material  
Track Material  
Transport Material  
Pick Material

The QMB used a **Combination Interrelationship Digraph/Matrix Diagram** (one of the 7MP tools) to prioritize and identify the critical process to focus on first:

### **Receive and Stock Material**

STEP 7: (a) DEFINING THE CRITICAL PROCESS - The QMB used a **Deployment Flowchart** to define the entire Receive and Stock Material critical process to the micro level as it currently operates (As-Is).

### **CASE-27(2)**

(b) REFINE THE CRITICAL PROCESS - The QMB used an **Opportunity Flowchart** to separate Value-Added from Cost-Added-Only steps, and then developed a **Deployment Flowchart** of the refined (Ideal) process, eliminating obvious complexity from the process.

STEP 8: SELECTING IN-PROCESS MEASUREMENTS - Having already established Output Measurements, the QMB developed related In-Process Measurements using a **Process Measurement Chart**.

STEP9: STANDARDIZING AND MEASURING THE PROCESS - The refined process, with measurement built in, was standardized, ensuring that the process was performed in a consistent manner by everyone working in the process. The previously established Output Measures were closely monitored to ensure no suboptimization resulted from the changes introduced in the refinement and measurement of the process. Baseline data from the In-Process Measures were collected.

STEP 10: ANALYZING PROCESS RESULTS - The QMB analyzed the data using **Run Charts** and **Control Charts** to assess and achieve stability in the measured quality characteristics, and **Histograms** to assess and achieve capability in the measured quality characteristics. They used these and other QC Tools, such as the **Cause and Effect Diagram**, to investigate the Cause System, and they used the **PDCA** as their process improvement methodology. Some of the results follow:

Most of the material damage was occurring before orders were filled, as noted by the measurements taken at the time material was received.

A significant improvement in customer satisfaction was realized as evidenced by a 58% reduction in customer-generated Reports of Discrepancy (RODs). The QMB found that the in-process measurement was preventing discrepant material from being passed on to the external customers.

The total number of RODs being generated had not changed, however. The QMB determined that the majority of damage was occurring before the material was received at the warehouse. This was reported to the ESC, who presented the data to the suppliers of the FISC. The resulting partnership with suppliers yielded substantial improvement.

### **CASE-27(3)**

As the number of RODs decreased, the number of FISC personnel fixing problems also decreased, which allowed some members of the ROD department to be assigned to more value-added work. The overall effect of the significant reduction in discrepant material was greatly improved customer satisfaction and substantial, unexpected cost savings for the FISC.

Material was being received by customers with inadequate shelf-life. This was mostly confined to grease and adhesive materials. Customers generally placed orders for these materials every six weeks, but the FISC was ordering them in large quantities every six months. The process was changed to order smaller quantities of these materials more frequently, resulting, once again, in increased customer satisfaction and cost savings for the FISC.

The QMB had achieved stability and capability in the Receive and Stock Material process, completing one cycle of Steps 6-11 of the Process management Flowchart, but their work was far from over. Their findings, lessons learned, and results of their efforts were published. As they continued to **MONITOR, IMPROVE AND SEARCH FOR INNOVATION (STEP 11)** in the Receive and Stock Material process, they checked with the ESC for any updates on customers' needs and organizational goals and returned to Step 6 to determine the next critical process to tackle.

The ESC continued to communicate with the external customers of the FISC and revisited Step 4 to consider chartering a second QMB for another significant process.